



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/791,046	03/01/2004	Emmanuel Drege	509982005900	1279
20872	7590	10/02/2007	EXAMINER	
MORRISON & FOERSTER LLP 425 MARKET STREET SAN FRANCISCO, CA 94105-2482				HIRL, JOSEPH P
ART UNIT		PAPER NUMBER		
2129				
MAIL DATE		DELIVERY MODE		
10/02/2007		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/791,046	DREGE ET AL.	
Examiner	Art Unit		
Joseph P. Hirl	2129		

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE three MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 24 August 2007.
2a) This action is **FINAL**. 2b) This action is non-final.
3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-50 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) Claim(s) _____ is/are allowed.

6) Claim(s) 1-50 is/are rejected.

7) Claim(s) _____ is/are objected to.

8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on 01 March 2004 is/are: a) accepted or b) objected to by the Examiner.

 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892) 4) Interview Summary (PTO-413)
2) Notice of Draftsperson's Patent Drawing Review (PTO-948) Paper No(s)/Mail Date. ____.
3) Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 8/24/7. 5) Notice of Informal Patent Application
6) Other: ____.

DETAILED ACTION

1. This Office Action is in response to an AMENDMENT entered August 24, 2007 for the patent application 10/791,046 filed on March 1, 2004.
2. All prior office actions are fully incorporated into this Office Action by reference.

Status of Claims

3. Claims 1-50 are pending in this application.

Prior Art

4. Examiner has reviewed the USPTO East database using the key term "optical metrology" and found 938 separate documents with appropriate dates related to applicant's filing date. Examiner has reviewed applicant's most recent Information Disclosure Statement dated August 24, 2007 and determined that there were 16 separate documents that are relevant as prior art to applicant's disclosure. Such prior art can be developed as claim rejections under USC 102 or 103. Under the guidance of MPEP, appropriate art was selected to write a rejection for the purpose of an office action. Such has been done by the prior Examiner and currently by the present Examiner. Applicant should be aware that other objects will follow should the current objections be overcome.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-50 are rejected under 35 U.S.C. 102(e) as being anticipated by Doddi et al., (USPPUBN 2004/0267397, referred to as **Doddi**).

The applied reference has a common assignee with the instant application.

Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Claim 1

Doddi anticipates selecting a profile model for use in examining a structure formed on a semiconductor wafer using optical metrology (¶¶ 0006 and 0059; Examiner's Note (EN): ¶ 11. applies), obtaining an initial profile model having a set of profile parameters (¶ 0026), training a machine learning system using the initial profile model (¶¶ 0006, lines 5-8 and 0059), generating a simulated diffraction signal for an optimized profile model using the trained machine learning system (¶ 0029), wherein

the optimized profile model has a set of profile parameters with the same or fewer profile parameters than the initial profile model (¶ 0024, last four lines), determining if one or more termination criteria are met (¶¶ 0052, last four lines and 0057, last four lines), and if the one or more termination criteria are not met, modifying the Optimized profile model and iterating steps c) to e) (¶ 0052, last four lines and 0057, last four lines), wherein the same trained machine learning system is used in iterating step c) (¶ 0065, lines 12-14).

Claim 22

Doddi anticipates a computer-readable storage medium containing computer executable instructions for causing a computer (¶ 0037) to select a profile model for use in examining a structure formed on a semiconductor wafer using optical metrology (¶¶ 0006 and 0059), obtaining an initial profile model having a set of profile parameters (¶ 0026), training a machine learning system using the initial profile model (¶¶ 0006, lines 5-8 and 0059), generating a simulated diffraction signal for an optimized profile model using the trained machine learning system (¶ 0029), wherein the optimized profile model has a set of profile parameters with the same or fewer profile parameters than the initial profile model (¶ 0024, last four lines), determining if one or more termination criteria are met (¶¶ 0052, last four lines and 0057, last four lines), and if the one or more termination criteria are not met, modifying the optimized profile model and iterating steps c) to e) (¶ 0052, last four lines and 0057, last four lines), wherein the same trained machine learning system is used in iterating step c) (¶ 0065, lines 12-14).

Claim 37

Doddi anticipates select a profile model for use in examining a structure formed on a semiconductor wafer using optical metrology (¶¶ 0006 and 0059), an optical metrology device configured to provide a measured diffraction signal (see figure 1 and ¶¶ 0020 and 0021), a first machine learning system trained using an initial profile model having a set of profile parameters (¶¶ 0006, lines 5-8 and 0059); the first machine learning system configured to generate a simulated diffraction signal for an optimized profile model having a set of profile parameters with the same or fewer profile parameters than the initial profile model (¶ 0024, last four lines), wherein if one or more termination criteria are not met, the optimized profile model is modified (¶ 0052, last four lines and section 0057, last four lines) and the first machine learning system generates another simulated diffraction signal (¶ 0052).

Claims 2, 23

Doddi anticipates obtaining a measured diffraction signal from an optical metrology device (¶ 0004, lines 1-3) and analyzing the simulated diffraction signal and the measured diffraction signal (¶ 0006, lines 3-6).

Claims 3, 24

Doddi anticipates the one or more termination criteria includes a cost function value determined based on the analysis of the simulated and measured diffraction signals (¶ 0067, lines 1-12).

Claims 4, 25, 38

Doddi anticipates the one or more termination criteria includes a preset goodness of fit (GOF)-value determined based on the analysis of the simulation and measured diffraction signals (Abstract; EN: GOF is synonymous with matching criterion).

Claims 5, 26

Doddi anticipates obtaining a measured diffraction signal from an optical metrology device (¶ 0006, lines 1-3) and obtaining a profile associated with the measured diffraction signal (¶ 0006, lines 1-6), wherein the one or more termination criteria includes parameter correspondence determined between the profile parameters of the optimized profile model and dimensions of the profile associated with the measured diffraction signal (¶ 0006, last five lines).

Claims 6, 27, 40

Doddi anticipates the one or more termination criteria includes a correlation coefficient determined between a pair of profile parameters of the optimized profile model (correlation coefficient are within the diffraction signals, ¶ 0052).

Claims 7, 28, 41

Doddi anticipates one or more termination criteria includes a sensitivity determined for a profile parameter of the optimized profile model (¶ 0006; EN: ¶ 11. applies; sensitivity is the process of determining a feature of the structure based on one or more parameters).

Claims 8, 29

Doddi anticipates selecting at least one profile parameter of the optimized profile model to eliminate or fix to a value (¶ 0047), and modifying the optimized profile model before iterating steps c) to e) by eliminating or fixing to a value the at least one profile parameter (¶ 0047).

Claims 9, 30, 43

Doddi anticipates training a first machine learning system using a set of training input data and a set of training output data (¶¶ 0006 and 0059), wherein each of the training input data is a profile, model having a set of profile parameters with the same profile parameters as the initial profile model (¶¶ 0006 and 0059), and wherein each of the training output data is a diffraction signal (¶¶ 0006 and 0059).

Claims 10, 31

Doddi anticipates the set of training output data is generated based on the set of training input data using a modeling technique prior to training the first machine learning system (¶ 0059).

Claim 11

Doddi anticipates the modeling technique included rigorous coupled wave analysis, integral method, Fresnel method, finite analysis, or modal analysis (the structure is analyzed, ¶ 0056, line 3).

Claim 12

Doddi anticipates obtaining training input data (0059), generating a diffraction signal with the first machine learning system using the training input data (0059),

Art Unit: 2129

determining if one or more termination criteria are met (0052, last four lines and section 0057, last four lines), and if the one or more termination criteria are not met, iterating steps g) to i) (¶¶ 0052, last four lines and 0057, last four lines).

Claim 13

Doddi anticipates iterating steps g) to i) (), and adjusting the machine learning system or using new training input data in step g) (¶ 0052).

Claim 14

Doddi anticipates testing the first machine learning system using a second machine learning system (¶ 0047).

Claims 15, 33

Doddi anticipates before testing the first machine learning system, training the second machine learning system using the training input" data for the first machine learning system as training output data for the second machine learning system (¶ 0047) and the training output data for the first machine learning system as training input data for the second machine learning system (¶ 0047).

Claims 16, 34

Doddi anticipates after training the second machine learning system, generating one or more simulated diffraction signals using one or more profile models as inputs to the first machine learning system (¶ 0047), generating one or more profile models using the one or more simulated diffraction signals generated by the first machine learning system as inputs to the second machine learning system (¶ 0047) and analyzing the one or more profile models generated by the second machine learning system and the

one or more profile models used as inputs to the first machine learning system (¶¶ 0047 and 0048).

Claims 17, 46

Doddi anticipates the machine learning system is a neural network (¶¶ 0042 and 0043, line 1).

Claims 18, 47

Doddi anticipates the optical metrology device is an ellipsometer or reflectometer (¶ 0049, line 15).

Claims 19, 48

Doddi anticipates the one or more profile parameters includes one or more of critical dimension measurements, angle of incidence, n and k values, or pitch (¶ 0027, last three lines).

Claims 20, 35, 49

Doddi anticipates if one or more termination criteria are met, selecting at least one profile parameter of the optimized profile model (¶¶ 0052 and 0057) and setting the at least one profile parameter to a determined value (¶¶ 0052 and 0057).

Claims 21, 36, 50

Doddi anticipates at least one profile parameter includes a thickness parameter, and wherein the determined value includes an average thickness measurement (¶ 0045, EN: a thickness parameter relates to one dimension similar to that of a bottom width; wherein does not require a step to be performed since the methodology will of itself provide a mean or average effect; MPEP 2111.04 applies).

Claim 39

Doddi anticipates a profile associated with the measured diffraction signal is obtained (¶ 0006) and wherein the one or more termination criteria includes parameter correspondence determined between the profile parameters of the optimized profile model and dimensions of the profile associated with the measured diffraction signal (¶ 0052 and 0057).

Claim 42

Doddi anticipates the optimized profile model is modified by selecting at least one profile parameter of the optimized profile model to eliminate or fix to a value (¶ 0047).

Claim 44

Doddi anticipates a second machine learning system trained using the training input data for the first machine learning system as training output data for the second machine learning system (¶ 0047) and the training output data for the first machine learning system as training input data for the second machine learning system (¶ 0047).

Claim 45

Doddi anticipates one or more simulated diffraction signals are generated using one or more profile models as inputs to the first machine learning system (¶ 0047), one or more profile models are generated using the one or more simulated diffraction signals generated by the first machine learning system as inputs to the second machine learning system (¶ 0047) and the one or more profile models generated by the second machine learning system are compared with the one or more profile models used as inputs to the first machine learning system (¶ 0047).

Response to Arguments

7. Applicant's arguments filed on December 18, 2006 (no new arguments were submitted with the RCE of August 24, 2007) related to Claims 1-50 have been fully considered but are not persuasive.

In reference to Applicant's argument:

In the Final Office Action, the Examiner cites to paragraph [0057] as disclosing "modifying the optimized profile if one or more termination criteria are met." The Examiner also asserts, "[t]he optimal process is adjusting the training process of a profile to reach a desired value." Applicants assert that paragraph [0057] clearly does not support the Examiner's assertions.

As an initial matter, the concept of a training process of a profile doesn't make sense. Instead, paragraph [0057] discloses re-training the machine learning system not the profile as asserted by the Examiner.

Examiner's response:

¶ 11. applies. The whole art of Doddi et al. applies. MPEP 2111.01 applies.
MPEP 2131.05 applies. Applicant has not defined optimization. Hence a training process to achieve an end result of the training is indeed an optimization process.

In reference to Applicant's argument:

Also, paragraph [0057] makes no mention of modifying or adjusting a profile. Instead, paragraph [0057] discloses generating a diffraction signal for a profile from a set of profiles used as testing input data. The generated diffraction signal is compared to a diffraction signal from a set of diffraction signals in testing output data. If the difference is not within a desired or predetermined margin, the machine learning system is re-trained. This process disclosed in paragraph [0057] does not revolve modifying or adjusting the profiles in the sort of profiles used as testing input data.

Examiner's response:

¶ 11. applies. Applicant has not defined profiles. MPEP 2111.01 applies.
MPEP 2131.05 applies. Diffraction signal corresponds with profile. Output is adjusted based on the diffraction signal comparison would appropriately adjust the corresponding profile ... ¶0057.

In reference to Applicant's argument:

In Applicant's earlier response, Applicants asserted that the Doddi reference could not be used as a reference under 35 USC 103 because the Doddi reference and the present application were assigned to Timbre Technologies, Inc, at the time of filing.

Examiner's response:

All claims are rejected under USC 35 § 102.

Examination Considerations

8. The claims and only the claims form the metes and bounds of the invention.

"Office personnel are to give the claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. *In re Prater*, 415 F.2d, 1393, 1404-05, 162 USPQ 541, 550-551 (CCPA 1969)" (MPEP p 2100-8, c 2, I 45-48; p 2100-9, c 1, I 1-4). The Examiner has full latitude to interpret each claim in the broadest reasonable sense. Examiner will reference prior art using terminology familiar to one of ordinary skill in the art. Such an approach is broad in concept and can be either explicit or implicit in meaning.

9. Examiner's Notes are provided with the cited references to prior art to assist the applicant to better understand the nature of the prior art, application of such prior art and, as appropriate, to further indicate other prior art that maybe applied in other office actions. Such comments are entirely consistent with the intent and spirit of compact

prosecution. However, and unless otherwise stated, the Examiner's Notes are not prior art but a link to prior art that one of ordinary skill in the art would find inherently appropriate.

10. Unless otherwise annotated, Examiner's statements are to be interpreted in reference to that of one of ordinary skill in the art. Statements made in reference to the condition of the disclosure constitute, on the face of it, the basis and such would be obvious to one of ordinary skill in the art, establishing thereby an inherent *prima facie* statement.

11. Examiner's Opinion: ¶¶ 8.-10. apply. The Examiner has full latitude to interpret each claim in the broadest reasonable sense.

Conclusion

12. Claims 1-50 are rejected.

Correspondence Information

13. Any inquiry concerning this information or related to the subject disclosure should be directed to the Primary Examiner, Joseph P. Hirl, whose telephone number is (571) 272-3685. The Examiner can be reached on Monday – Thursday from 5:30 a.m. to 4:00 p.m.

As detailed in MPEP 502.03, communications via Internet e-mail are at the discretion of the applicant. Without a written authorization by applicant recorded in the applicant's file, the USPTO will not respond via e-mail to any Internet correspondence which contains information subject to the confidentiality requirement as set forth in 35 U.S.C. 122. A paper copy of such correspondence will be placed in the appropriate patent application. The following is an example authorization which may be used by the applicant:

Notwithstanding the lack of security with Internet Communications, I hereby authorize the USPTO to communicate with me concerning any subject matter related to the instant application by e-mail. I understand that a copy of such communications related to formal submissions will be made of record in the applications file.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, David R. Vincent can be reached at (571) 272-3080. Any response to this office action should be mailed to:

Commissioner of Patents and Trademarks,
Washington, D. C. 20231;

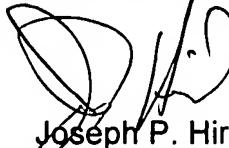
Hand delivered to:

Receptionist,
Customer Service Window,
Randolph Building,
401 Dulany Street,
Alexandria, Virginia 22313,
(located on the first floor of the south side of the Randolph Building);

or faxed to:

(571) 273-8300 (for formal communications intended for entry).

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have any questions on access to Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll free).



Joseph P. Hirl
Primary Examiner
September 25, 2007